

# CNT-based Reinforcing Polymer Matrix Composites for Lightweight Structures, Phase I

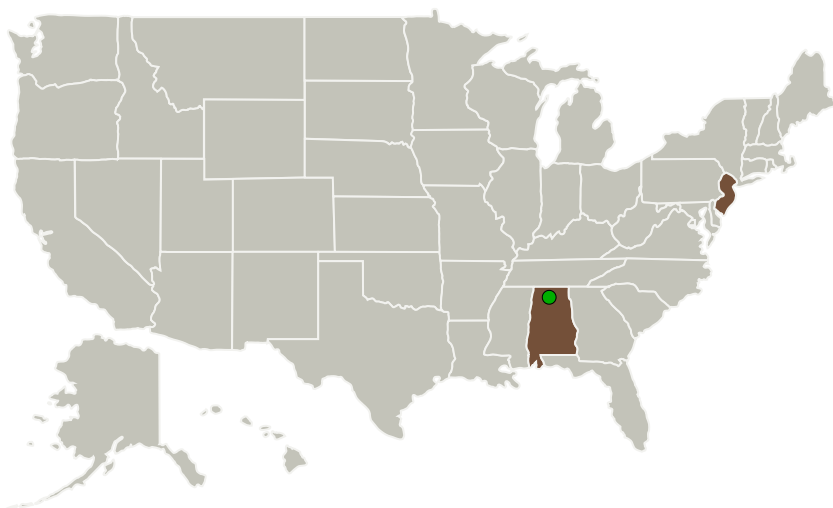
Completed Technology Project (2012 - 2012)



## Project Introduction

Carbon Polymer Matrix Composites (PMCs) are attractive structural materials for NASA applications due to their high strength to weight ratio, mechanical properties that can be tailored to specific applications, and fatigue resistance. Reinforcing specific critical areas in PMCs is most advantageous for structural durability. Since carbon nanotubes (CNTs) have exceptionally high tensile strength, they can be used as a functional additive to enhance the mechanical properties of PMCs in these critical areas. However, there are known issues with dispersing and aligning CNTs in the polymer matrix, thus limiting their strength-bearing properties. The proposed Phase I program aims to demonstrate a novel means of incorporating aligned CNTs specifically, and only, where they are needed during fabrication of a PMC component structure, thus limiting their use to specific areas where they are wanted. The key innovation uses a commercially-viable nanofiber technology to both disperse and to align the CNTs. The continuous nanofibers will be formed into Nanofiber-Reinforcing Mats (NRMs) which will be used during layup of the carbon PMC structure and placed only where added reinforcement is needed. For demonstration of feasibility in Phase I, prepregs will be used, but the concept is adaptable to other forms of PMC manufacturing such as filament winding. In Phase II we will scale-up the technology and fabricate large test samples, which will involve working with a prepreg manufacturer and fabricator of PMC component parts, in order to meet NASA specifications.

## Primary U.S. Work Locations and Key Partners



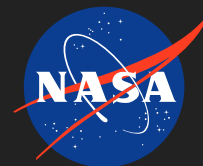
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Organizations Performing Work	Role	Type	Location
NEI Corporation	Lead Organization	Industry Small Disadvantaged Business (SDB)	Piscataway, New Jersey
● Marshall Space Flight Center(MSFC)	Supporting Organization	NASA Center	Huntsville, Alabama

## Primary U.S. Work Locations

Alabama	New Jersey
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## Project Transitions

**February 2012:** Project Start**August 2012:** Closed out

## Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/138041>)

## Organizational Responsibility

**Responsible Mission Directorate:**

Space Technology Mission Directorate (STMD)

**Lead Organization:**

NEI Corporation

**Responsible Program:**

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

**Program Director:**

Jason L Kessler

**Program Manager:**

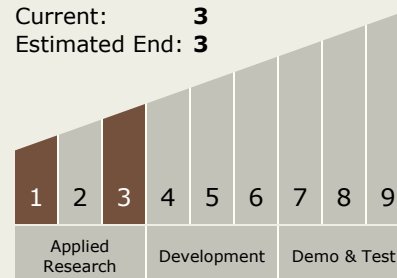
Carlos Torrez

**Principal Investigator:**

Daniel E Eberly

## Technology Maturity (TRL)

Start: **1**  
 Current: **3**  
 Estimated End: **3**



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## Technology Areas

### Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  - └ TX12.1 Materials
    - └ TX12.1.1 Lightweight Structural Materials

## Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System